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Claims

1. A method for performing maintenance in an inhaler having an ejector head with plural nozzles, comprising the steps of:

5 (a) during an operational mode of the inhaler, monitoring an operational aspect of the inhaler; and

(b) in response to the operational aspect reaching a critical value, initiating a maintenance mode in which the ejector head is disabled and fluid under positive pressure is purged through said nozzles.

10 2. The method according to claim 1 in which the operational aspect comprises a signal from a sensor.

3. The method according to claim 2 in which the operational aspect is a temperature of a portion of the ejector head.

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4. The method according to claim 2 including the step of firing the ejector head during the operational mode and recording the number of times that the ejector head is fired, and wherein the operational aspect comprises the number of times that the ejector head has been fired.

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5. The method according to claim 1 wherein during the operational mode the ejector head operates at a negative gauge pressure.

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6. The method according to claim 5 where during the maintenance mode the ejector head operates at a positive gauge pressure.

5 7. The method according to claim 1 including the step of testing the operational condition of the inhaler after a maintenance mode by monitoring an operational aspect to determine if the operational aspect is within a predetermined normal value.

10 8. The method according to claim 7 wherein the testing step comprises activating the nozzles to eject fluid therethrough while monitoring the operational aspect.

15 9. The method according to claim 8 wherein the operational aspect is a temperature of a portion of the ejector head.

10. A method of determining the condition of an ejector head in a thermal drop generator delivery apparatus, comprising the steps of:

20 (a) operating the drop generator in an operational mode to eject a first fluid through the ejector head and measuring the temperature of portion of the ejector head to obtain a temperature value;

(b) comparing the temperature value with a predetermined temperature threshold value;

(c) if the temperature value exceeds the predetermined threshold value, initiating an ejector head maintenance operation.

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11. The method according to claim 10 wherein the ejector head maintenance operation further comprises the steps of:

- (a) disabling the ejector head; and
- (b) causing fluid to flow under pressure through the ejector head.

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12. The method according to claim 11 including after step 11(b) enabling the thermal drop generator and operating the ejector head while measuring the temperature of a portion of the ejector head to obtain a temperature value, and comparing the temperature value with a
10 predetermined temperature threshold value.

13. The method according to claim 10 wherein the fluid in step 11(b) is the first fluid.

15 14. The method according to claim 10 wherein the ejector head maintenance operation further comprises causing a maintenance fluid to flow under pressure through the ejector head.

20 15. The method according to claim 14 wherein the maintenance fluid is the same as the first fluid.

16. The method according to claim 14 wherein the maintenance fluid is different from the first fluid.

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17. The method according to claim 16 wherein the maintenance fluid comprises a cleaning compound.

18. A medication delivery apparatus, comprising:

5 a first pressurized supply of fluid in a reservoir;

a fluid conduit from the supply to an ejector head and a valve in the fluid conduit between the supply and the head;

10 a programmable controller capable of operating the delivery apparatus in a first operational mode wherein the ejector head is operable to deliver fluid from the supply through the ejector head, and in a second maintenance mode wherein the ejector head is disabled and fluid is purged through the ejector head.

15 19. The apparatus according to claim 18 including pressure regulation apparatus in the reservoir to maintain the supply of fluid in a pressurized state.

20 20. The apparatus according to claim 18 wherein in the first operational mode fluid in the ejector head is at a lower pressure relative to the fluid in the reservoir.

21. The apparatus according to claim 18 including sensor means for monitoring an operational aspect of the ejector head.

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22. The apparatus according to claim 21 where the sensor means comprises a temperature sensor capable of measuring the temperature of a portion of the ejector head.

5 23. The apparatus according to claim 22 wherein the temperature sensor is under the control of the programmable controller.

24. The apparatus according to claim 21 wherein the sensor means comprises a counter for counting the number of times that the ejector head
10 has been activated.

25. The apparatus according to claim 21 wherein the sensor means comprises a clock for measuring the time interval from a prior maintenance mode.
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26. The apparatus according to claim 18 including a second pressurized supply of fluid in a reservoir and a fluid conduit from the second pressurized supply of fluid to the ejector head and a valve in the fluid conduit.

20 27. The apparatus according to claim 26 wherein the fluid in the first pressurized supply of fluid comprises a medication.

28. The apparatus according to claim 27 wherein the fluid in the second pressurized supply of fluid comprises a maintenance fluid.
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29. A method of nozzle maintenance for an inhalation system comprising:

providing an ejector head having nozzles;

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coupling a fluid supply system to the ejector head, the fluid supply having an operating fluid supply pressure during operation of the nozzles wherein the nozzles eject aerosol;

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initiating a nozzle maintenance mode; and

supplying fluid to the drop ejection nozzles at a purge pressure different than the operating fluid supply pressure during the nozzle maintenance mode.

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30. The method according to claim 29 in which the purge pressure is greater than the operating fluid supply pressure.

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31. The method according to claim 30 wherein the operating fluid supply pressure is a negative gauge pressure and the operating fluid supply pressure is a positive gauge pressure.

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32. The method according to claim 29 wherein the step of supplying fluid to the ejector head at the operating fluid supply pressure includes the step of supplying fluid from a first fluid supply.

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33. The method according to claim 32 where the step of supplying fluid to the ejection nozzles at a purge pressure includes the step of supplying fluid from a first fluid supply.

5 34. The method according to claim 29 including providing the fluid supply system with a first fluid supply and a second fluid supply, and wherein the step of supplying fluid to the ejection nozzles at a purge pressure includes the step of supplying fluid from the second fluid supply.

10 35. The method of claim 29 further comprising monitoring operation of the ejector head and initiating the maintenance mode in response to improper operation of the ejector head.

15 36. The method of claim 35 including monitoring the temperature of a portion of the ejector head and initiating the maintenance mode in response to an increase in the temperature.

37. The method according to claim 29 further comprising disabling the ejector head before initiating the maintenance mode.

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38. An inhalation system comprising:

an ejector head;

a fluid supply system having a pressure regulation apparatus that supplies fluid to the ejector head at a controllable pressure; and

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5 a control system configured to control the fluid supply system in two different modes including (a) an operating mode wherein the fluid is supplied to the ejector head with an operational pressure and (b) an ejector head purge mode wherein the fluid supply pressure is at a purge pressure that is different from the operational pressure.

39. The inhalation system according to claim 38 wherein the ejector head includes thermal drop generators.

10 40. The inhalation system according to claim 38 wherein the fluid at the operational pressure is at a negative gauge pressure.

41. The inhalation system according to claim 40 wherein the fluid at the purge pressure is at a positive gauge pressure.

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42. The inhalation system according to claim 38 in which the fluid supply system includes first and second fluids, and wherein the control system is configured for supplying the first fluid to the ejector head in the operating mode and the second fluid to the ejector head in the ejector head
20 purge mode.

43. The inhalation system according to claim 42 in which the first fluid comprises a medication and the second fluid comprises a maintenance fluid.